

CLAIMS

What is claimed is:

1. A method of reducing artifacts in steady state free precession (SSFP) signals
5 for use in magnetic resonance imaging comprising the steps of:

- a) applying a plurality of SSFP imaging sequences to an object to be imaged,
- b) acquiring image data for each of the SSFP imaging sequences,
- c) weighting the image data to emphasize higher signals,
- d) combining the weighted image data, and
- 10 e) establishing an image signal based on the combined weighted image data.

2. The method as defined by claim 1 wherein the plurality of SSFP imaging sequences are phase-cycled.

15 3. The method as defined by claim 2 wherein step c) squares the image data for each sequence, and step d) sums the squares of the image data.

4. The method as defined by claim 3 wherein step e) establishes an image signal from the square root of the sum of the squares of the image data.

20 5. The method as defined by claim 2 wherein step c) weights the image data based on a computed off-resonance profile using a magnetic field map for the imaged object.

6. The method as defined by claim 2 wherein N phase-cycled individual SSFP image
25 acquisitions are performed with the nth acquisition incrementing the phase from excitation to excitation by

$$\Delta\phi = 2\pi n/N.$$

7. The method as defined by claim 6 wherein step c) squares the image data for each sequence, and step d) sums the squares of the image data.

5 8. The method as defined claim 7 wherein step e) establishes an image signal from the square root of the sum of the squares of the image data.

9. The method as defined by claim 8 wherein the SSFP image data is two-dimensional.

10 10. The method as defined by claim 8 wherein the SSFP image data is three-dimensional.

11. The method as defined by claim 1 wherein the SSFP image data is two-dimensional.

12. The method as defined by claim 1 wherein the SSFP image data is three-dimensional.

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13. The method as defined by claim 1 wherein each SSFP imaging sequence includes:

- i) placing a body in a magnetic field,
- ii) applying gradient magnetic fields to the body,
- iii) applying a plurality of RF excitation pulses to the body at repetition time, TR,
20 to flip nuclei spins, with RF phase incremental from TR to TR by a phase increment, $\Delta\phi$
- iv) rewinding all gradients over each repetition time, TR,
- v) measuring refocused MRI signals at echo times, TE during each sequence, and
- vi) repeating steps ii-v) for subsequent sequences with the RF excitation pulses in
each sequence being incremented in phase by a different $\Delta\phi$.

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